

Question Booklet Series:

A**Polytechnic Entrance Test - 2018
QUESTION BOOKLET****INSTRUCTIONS**

Question Booklet Number:

Maximum Time Allowed : 3 Hours

Negative Marking : 0.25 Marks

Roll Number:

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Answer Sheet Number:

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No. of Questions: 180

Maximum Marks: 180

Please read the following instructions carefully.

1) **Check the booklet thoroughly:** In case of any defect – Misprint, missing question(s) or duplication of question(s) / Page(s), get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test is over. 2) Write your Roll Number and the OMR Answer Sheet Number on the question booklet. 3) Mark carefully your Roll Number, Question Booklet Number, Paper Code, Question Booklets series and Course on the OMR Answer sheet and sign at the appropriate place. Candidates shall be personally responsible for any mistake committed in making these entries in the OMR Answer Sheet. Board shall under no circumstances be responsible for any such mistake.

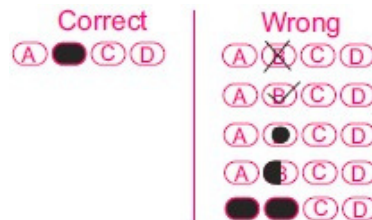
4) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the written test.

6) Please mark the right responses on the OMR Sheet with ONLY a Blue/Black ball point pen. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is NOT allowed.

7) The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Your task is to choose the correct/best response and mark your response on the OMR Answer Sheet and NOT on the Question Booklet.

8) There will be negative marking of 0.25 marks for every wrong answer. 9) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Darken only ONE circle for each question. If you darken more than one circle, it will be treated as wrong answer. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



10) Please be careful while marking the response to questions. The response once marked cannot be changed and if done shall be treated as wrong answer.

11) In view of the tight time span, do NOT waste your time on a question which you find to be difficult. 12) DO NOT make any stray marks anywhere in or around the oval on the OMR Answer Sheet. It will be read as double shading and will make answer invalid. DO NOT fold or wrinkle the OMR Answer Sheet.

13) Rough work MUST NOT be done on the OMR Answer Sheet. Use your test booklet for this purpose. 14) Candidates are provided carbonless OMR Answer Sheet having original copy and candidate's copy. After completing the examination, candidates are directed to fold at perforation on the top of the sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

Section 1 – English

1) Choose the correct pattern for the given sentence.

When he was seven, Ganguly moved to Delhi.

- A) Subject+Verb
 - B) Subject+Verb+Indirect Object
 - C) Object+Subject+Verb
 - D) Adjunct+Subject+Object+Adjunct
-

2) Choose the correct pattern for the given sentence.

Meeta cooks deliciously.

- A) Subject+Verb+Object
 - B) Subject+Verb
 - C) Subject+Verb+Adverb
 - D) Subject+Verb+Indirect Object
-

3) Complete the sentence with the infinitive form of the verb.

They set off early from their home _____ traffic.

- A) to capture
 - B) to avoid
 - C) to blocking
 - D) to meeting
-

4) Complete the sentence by choosing the correct pronoun.

The children do not like Hindi movies so, this video is not for _____.

- A) him
- B) you
- C) her
- D) them

5) Complete the sentence by choosing the past perfect tense of the verb given in the brackets.

Tina went to the party, after she _____ (finish) her assignment.

- A) had finished
 - B) finished
 - C) has finished
 - D) having finished
-

6) Complete the sentence by choosing the correct pronoun.

_____ is the book I left in your house.

- A) Those
 - B) This
 - C) These
 - D) Whose
-

7) Choose the suitable modal to complete the sentence.

You _____ talk badly of our teacher.

- A) should
 - B) would
 - C) shouldn't
 - D) wouldn't
-

8) Select the suitable conjunction to complete the sentence.

He said that he'll call me, _____ he arrives at the destination.

- A) after
- B) and
- C) although
- D) or

9) Select the correct conjunction to join the sentence.

_____ he was cleaning the dishes, she was cooking the food.

- A) After
 - B) While
 - C) Once
 - D) Or
-

10) Choose the sentence with the pattern:

Subject+Verb+Object+Adverb

- A) I love a sunny day.
 - B) I like moderate weather, very much.
 - C) It is a fantastic day.
 - D) Moderate weather is good.
-

11) Choose the sentence that has the pattern:

Subject+Verb+Indirect Object+Direct Object.

- A) My friend sent me a present.
 - B) Birds fly in the sky.
 - C) The officer wants to retire.
 - D) The flower is beautiful.
-

12) Identify the clause in the underlined part of the sentence.

He is healthy, because he eats healthy food.

- A) relative
 - B) independent
 - C) dependent
 - D) noun
-

13) Choose the suitable conjunction to join the sentence.

He ran the marathon, _____ his ankle was injured.

- A) as
 - B) because
 - C) or
 - D) although
-

14) Choose the suitable modal to complete the sentence.

Be careful, the kids _____ swallow these small objects.

- A) couldn't
 - B) should
 - C) would
 - D) may
-

15) Choose the correct modal to complete the sentence.

There are plenty of vegetables in the refrigerator; you _____ buy any.

- A) wouldn't
 - B) couldn't
 - C) should
 - D) needn't
-

16) Identify the sentence that is in Reported Speech.

He said, " I like this movie."

- A) He said that he liked that movie.
 - B) He said that he liked this movie.
 - C) He said he liked this movie.
 - D) He said that he liked a movie.
-

17) Complete the sentence by choosing the correct pronoun.

The car is _____ ; I bought it yesterday.

- A) my
 - B) her
 - C) him
 - D) mine
-

18) Choose the correct conjunction to join the sentence.

I don't like sugar in my coffee _____ I like milk in it.

- A) and
 - B) or
 - C) so
 - D) but
-

19) Identify the sentence that is in the reported speech.

She said, "I will water the plants".

- A) She said I would water the plants.
 - B) She said that she will water the plants.
 - C) She said that she would water the plants.
 - D) She said she would water the plants.
-

20) Complete the sentence by choosing the past perfect tense of the verb given in the brackets.

She _____ (be) to Mumbai before 2016.

- A) have not been
 - B) has been going
 - C) had not been
 - D) has been
-

21) Identify the clause in the underlined part of the sentence.

Sheena played with her baby brother, before she left to school.

- A) dependent
 - B) independent
 - C) relative
 - D) adverbial
-

22) Choose the correct sentence with the pattern:

Adjunct+Subject+Verb+Indirect Object+ Direct
Object+Adjunct

- A) The dog ran across the farm.
- B) The cows wandered, all around the field.
- C) The judge punished the criminal.
- D) At the beginning of the race, the driver showed his partner the route, on his mobile.

23) Identify the clause in the underlined part of the sentence.

They decided to go to the park, although the weather was not very good.

- A) relative
 - B) adverbial
 - C) dependent
 - D) independent
-

24) Identify the sentence that is in reported speech.

He said, "I was playing video games, when the house caught fire".

- A) He said that the house caught fire, when I was playing the video games.
 - B) He said that he had been playing video games, when the house caught fire.
 - C) He said that he was playing video games, when the house caught fire.
 - D) He said he is playing video games, when the house caught fire.
-

25) Choose the correct modal to complete the sentence.

You _____ stop when the traffic light is red.

- A) musn't
 - B) could
 - C) need
 - D) must
-

26) Choose the infinitive form to complete the sentence.

He went to the Automated Teller Machine(ATM) _____ some money.

- A) to draw
- B) saving
- C) counting
- D) to supplying

Section 2 – Physics

27) Complete the sentence by choosing the past perfect tense of the verb given in the brackets.

The children picked up the mangoes that _____ (fall) from the trees.

- A) have fallen
- B) had fallen
- C) fell
- D) have been falling

28) Complete the sentence by choosing the infinitive form of the verb.

It was hard _____ Lata singing in the party.

- A) imagining
- B) to seeing
- C) to imagine
- D) hearing

29) Choose the correct pattern for the given sentence.

I wish you happy birthday.

- A) Subject+Verb
- B) Subject+Verb+Object
- C) Subject+Verb+Indirect Object+Direct Object
- D) Subject+Verb+Indirect Object

30) Complete the sentence by using the correct pronoun.

_____ horse won the race at the Derby?

- A) What
- B) That
- C) Which
- D) Those

31) Which of the following defects can be corrected by using a convex lens eye glasses of appropriate power?

- A) Hypermetropia
- B) Myopia
- C) Presbyopia
- D) Cataract

32) A wire of resistance 40Ω is bent to form a square. The resistance which will be available across the diagonal of that square is

- A) 5Ω
- B) 10Ω
- C) 15Ω
- D) 25Ω

33) The power consumed by a bulb of rating 220 volt and 60 Watt when it is connected to a 110-volt source is

- A) 25 W
- B) 20 W
- C) 30 W
- D) 15 W

34) The image formed by a converging lens which has a focal length of 20cm and has an object kept at a distance of 50cm will be at a distance of approximately

- A) 15 cm
- B) 24 cm
- C) 33 cm
- D) 42 cm

35) The amount of electric energy consumed when an electric appliance of 1-watt power is used for 1 hour is known as

- A) One kilowatt-hour
 - B) One Watt
 - C) One Watt-hour
 - D) One Joule
-

36) The relation connecting charge 'Q', potential difference 'V' and work done 'W' is

- A) $V = W/Q$
 - B) $V = Q/W$
 - C) $W = V/Q$
 - D) $V = WQ$
-

37) The current drawn by an electric toaster of power rating 1 kW which is operated in a domestic electric circuit of 220V and 5A is

- A) 1.54 A
 - B) 15.4 A
 - C) 4.54 A
 - D) 44 A
-

38) A thin membrane which covers the eyeball and acts like a lens to refract the light entering the eye is

- A) Retina
 - B) Aqueous Humour
 - C) Cornea
 - D) Pupil
-

39) Two light waves having wavelength 2800 \AA and 5600 \AA travel through vacuum. The ratio of their velocities are

- A) 1:1
 - B) 1:2
 - C) 2:1
 - D) 1:3
-

40) The focal length of the lens which is used for correcting the distant vision of a person who uses a lens of power -5D is

- A) (- 2) cm
 - B) (5) cm
 - C) (0.20) cm
 - D) (- 20) cm
-

41) The fuel which exists in liquid state at room temperature is

- A) Water gas
 - B) Petroleum
 - C) Bagasse
 - D) Briquettes
-

42) The substitute for gasoline or propane fuel is

- A) Nuclear energy
 - B) Biogas
 - C) Freon
 - D) Compressed Natural Gas
-

43) The heat 'H' produced in a conductor which consists of resistance 'R', current 'I' flowing through it for 't' seconds is

- A) $H = I^2 R t \text{ J}$
 - B) $H = I R t \text{ cal}$
 - C) $H = I R^2 t / 4.18 \text{ J}$
 - D) $H = I^2 R t / 4.18 \text{ J}$
-

44) The approximate equivalent resistance of a combined circuit which consists of a 12Ω resistance cut into three equal parts and connected in parallel is

- A) 1Ω
 - B) 1.3Ω
 - C) 2.5Ω
 - D) 4Ω
-

45) If an electric heater consumes 1250W at 220V, then the electric current in the circuit approximately is

- A) 0.18 A
 - B) 2.75 kA
 - C) 3.4 A
 - D) 5.7 A
-

46) A circuit consists of an ammeter and a nichrome wire connected in series across a battery. The ammeter reading when the experiment is repeated with a nichrome wire of twice its initial length and same thickness is

- A) Half of the initial
- B) Same as initial
- C) Twice as initial
- D) One-fourth of the initial

47) A mirror which has an object placed at a distance of 20cm from it has an image formed at a distance of 4cm to the right of the mirror. The mirror and the focal length of the mirror used is

- A) Convex, 3cm
- B) Concave, 3cm
- C) Convex, 5cm
- D) Concave, 5cm

48) The number of electrons that will cross any cross-section of a conductor in one second when a current of one Ampere flows through it is

- A) 6.25×10^{18}
- B) 1.6×10^{18}
- C) 3.2×10^{18}
- D) 6.45×10^{18}

49) The percentage change in the resistance of a resistance wire which is stretched uniformly to increase its length by 20 percentage is

- A) 14%
- B) 20%
- C) 24%
- D) 44%

50) The linear magnification of a diverging lens of focal length 18cm which forms an image at a distance of 15cm from the lens is

- A) 0.13
- B) 0.16
- C) 2
- D) 3

51) The approximate resistance of the device which has a rating of 220V and 60W is

- A) 200 Ω
- B) 320 Ω
- C) 524 Ω
- D) 806 Ω

52) The type of corrective lens which should be used by a myopic defect person who cannot see objects beyond 1.5m distinctly is

- A) Concave lens
- B) Convex lens
- C) Bifocal lens
- D) Plano-convex lens

53) The energy in kWh consumed by a bulb in 4 hours, if it has a resistance of 100Ω and draws a current of 2A is

- A) 8 kWh
- B) 1.6 kWh
- C) 3.2 kWh
- D) 6.4 kWh

54) An object kept between the focus and centre of curvature of a concave mirror forms a real image beyond the centre of curvature. This position of the mirror is mainly used in

- A) Shaving mirrors
- B) Flood lights
- C) Torches
- D) Solar devices

55) If 'I' is the current flowing through a wire at a given voltage 'V' and if the wire is divided into two equal halves, then the resistance of each half is

- A) $R/2$
- B) $2R$
- C) R
- D) $R/4$

56) The position of the object for a converging mirror of radius of curvature 40 cm which forms an erect image which is 4 times the size of the object is

- A) -15 cm
- B) +15 cm
- C) +25 cm
- D) -25 cm

57) The refractive index of alcohol is 1.36, water is 1.33, ice is 1.31 and that of kerosene is 1.44. The light will travel faster in

- A) ice
- B) water
- C) alcohol
- D) kerosene

58) A tiny magnetic needle when placed above or below a straight conductor deflected, when a current was passed through the conductor. This was observed by

- A) Faraday
- B) H. C. Oersted
- C) Ampere
- D) James Maxwell

59) If a net charge 'Q' flows through the matter for a time 't', then the electric current 'I' flowing through it is given by

- A) $I = Qt$
- B) $I = Q/t$
- C) $I = t/Q$
- D) $I = 1/Qt$

60) The main source of energy used in traffic signals or wireless transmission systems in remote locations is

- A) Fossil fuels
- B) Solar cells
- C) Transmitter
- D) Solar heater

61) A spherical mirror whose outer curved side is the reflecting surface and inner surface is polished is a

- A) Concave mirror
- B) Plano -concave mirror
- C) Convex mirror
- D) Plane mirror

62) Heat energy generated and stored in the earth is

- A) Wind energy
- B) Nuclear energy
- C) Tidal energy
- D) Geo-thermal energy

63) If the frequency of the light incident on a convex mirror is increased, then the focal length of the mirror will

- A) increase
- B) decrease
- C) become infinite
- D) not change

64) The magnetic field at the centre of a coil of 5 turns which carries a current of 0.1A and has a circular coil of radius 0.10m is

- A) $0.314 \times 10^{-7}T$
- B) $314 \times 10^{-7}T$
- C) $3.14 \times 10^{-7}T$
- D) $31.4 \times 10^{-7}T$

65) A cylindrical coil containing several number of close turns of insulated wire whose length is greater than its radius is a

- A) electromagnet
- B) solenoid
- C) bar magnet
- D) motor

66) The device which works on the phenomenon in which induced current is produced due to the relative motion between the magnet and the coil is

- A) Electric lamp
- B) Electric fan
- C) Electric kettle
- D) Electric heater

67) A person visits a barber shop and sees two plane mirrors kept parallel to each other. The number of images that will be formed is

- A) Zero
- B) Three
- C) Infinity
- D) One

68) The focal length of the combination of two thin lens of powers +5D and -2D which are in contact is

- A) 3.33 cm
- B) 14.2 cm
- C) 33.33 cm
- D) 0.14 cm

69) The direction of magnetic field at 0.5m above a current carrying wire which carries current from west to east is

- A) North to South
- B) South to North
- C) West to East
- D) East to West

70) The potential energy of water at a height or the kinetic energy of flowing water is used in

- A) Solar cells
- B) Ocean thermal energy
- C) Hydro power plants
- D) Wind energy

71) What is the flux density at the centre of a solenoid of length 1m, which has 4 layers of 1200 turns each and a current of 2A flowing through it?

- A) 0.012 T
- B) 0.017 T
- C) 0.12 T
- D) 0.17T

72) Sometimes, the thermal power plants make use of natural gas as a fuel because it consists primarily of

- A) Methane
- B) Nitrogen
- C) Carbon dioxide
- D) Hydrogen sulphide

73) A current carrying loop when placed in a magnetic field experiences a force and the direction of rotation of the loop is given by "Fleming's left-hand rule". This is the working principle of

- A) Electric generator
- B) Electric motor
- C) Solenoid
- D) Galvanometer

74) A device which checks the overflow of current in the circuit and hence protects the appliance connected to the circuit is

- A) Split ring
- B) Brushes
- C) Fuse
- D) Cell

75) The law that helps in determining the magnetic field at a point near a current element is

- A) Laplace's law
- B) Maxwell's law
- C) Ampere's law
- D) Gauss's law

Section 3 - Chemistry

76) The burning of fossil fuels releases oxides of carbon, nitrogen and sulphur which are acidic oxides. This is primarily the reason for

- A) Green house effect
- B) Acid rain
- C) Biomass
- D) Solar energy

77) The example of a renewable energy source is

- A) Coal
- B) Sunlight
- C) Oil
- D) Natural gas

78) The defect which happens to human eye due to the gradual weakening of ciliary muscles is

- A) Cataract
- B) Presbyopia
- C) Astigmatism
- D) Myopia

79) The electrons that can come out of the negative terminal of a cell in 4 minutes when a 4V cell is connected to a 2Ω resistor is

- A) 12.24×1020
- B) 22.34×1020
- C) 30×1020
- D) 120×1020

80) The speed of light in vacuum is $3 \times 10^8 \text{ ms}^{-1}$ and the refractive index of glass is 1.45. If the light enters from air to glass, then the speed of light in glass is

- A) $0.48 \times 10^{-8} \text{ ms}^{-1}$
- B) $2.1 \times 10^8 \text{ ms}^{-1}$
- C) $3 \times 10^8 \text{ ms}^{-1}$
- D) $3.2 \times 10^8 \text{ ms}^{-1}$

81) An element **P** forms an oxide which is acidic in nature. It is a solid and non-conductor of heat and electricity. From its salt solution, the element **P** is precipitated on passage of electric current releasing two electrons per anion. The element **P** must be occurring in the periodic table in the group:

- A) Group 1
- B) Group 2
- C) Group 12
- D) Group 16

82) This element has the electronic configuration $[\text{Ar}] 3d^{10}4s^2$. It is a silvery-white metal with a blue tinge. It tarnishes in air. To which group of the periodic table does this element belong?

- A) Group 1
- B) Group 2
- C) Group 12
- D) Group 16

83) An element **X** has three electron shells (electronic configuration $[\text{Ne}]3s^23p^5$) and occurs in group 17. The element occurring in the next period in the same group will be:

- A) Astatine
- B) Fluorine
- C) Iodine
- D) Bromine

84) There are four test tubes. The first one contains muriatic acid $[\text{pH} = 1]$, the second one contains citric acid $[\text{pH} = 2.3]$, the third one contains acetic acid $[\text{pH} = 2.9]$ and the fourth one contains boric acid $[\text{pH} = 5.2]$. On reaction with granulated zinc, the one which will be able to release hydrogen the fastest will be:

- A) Muriatic acid
- B) Citric acid
- C) Acetic acid
- D) Boric acid

85) In a chemical process, at high temperature, carbon reduces zinc oxide to zinc and itself gets oxidised to carbon monoxide. This zinc which may contain impurities like cadmium, carbon, arsenic and iron is known as:

- A) Zinc spelter
- B) Zinc blende
- C) Sphalerite
- D) Zincite

86) On touching nettle leaves a stinging sensation is experienced. On washing the place with baking soda solution, the stinging sensation goes away. One of the reasons for the stinging sensation is because nettle leaves contain:

- A) Magnesium hydroxide
- B) Oxalic acid
- C) Ethanoic acid
- D) Methanoic acid

87) Metals have a lot of characteristic properties. The property of malleability in metals is exhibited because of:

- A) Metals having rigid crystalline structures
- B) Metals having metallic bonds extending in multi-directions
- C) Metals having metallic bonds only in uni-direction
- D) Metals having amorphous micro crystalline structures

88) Few drops of liquid **X** are heated with few drops of glacial acetic acid in the presence of concentrated H_2SO_4 , when a sweet-smelling compound is produced. What is **X**?

- A) Ethene
- B) Ethane
- C) Ethanol
- D) Ethanal

89) Two organic compounds **A** and **B** share the same molecular formula **$\text{C}_3\text{H}_8\text{O}$** , but their chemical and physical properties are totally different. The relation between **A** and **B** is:

- A) They are homologous
- B) They are isomers
- C) They are isotopes
- D) They are isochores

90) In industries, vegetable oil can be turned to vegetable ghee by which of the following reactions?

- A) Polymerisation reaction
- B) Condensation reaction
- C) Hydrogenation reaction
- D) Compression reaction

91) Beautiful golden yellow spangles are formed when lead nitrate solution is added to potassium iodide solution. This is an example of:

- A) Displacement reaction
- B) Double displacement reaction
- C) Nitration reaction
- D) Iodoform reaction

92) Identify out of the following, which one is an example of oxidation reaction?

- A) While storing salt in the rainy season, it forms lumps
- B) While storing cement, it turns solid if not properly packed
- C) While storing butter for a long duration, it turns bitter
- D) While storing biscuits, they turn soggy if not kept in an air-tight container

93) When alkaline potassium permanganate is heated with ethanol, the pink colour of alkaline potassium permanganate gradually disappears. This is due to conversion of ethanol to

- A) Ethyl ethanoate
- B) Ethyl permanganate
- C) Ethanoic acid
- D) Ethoxyethane

94) Ethanol is the only alcohol which is fit for human consumption. But consumption of even a small quantity of methanol of the same homologous series can lead to death because it gets converted to:

- A) Methyne
- B) Methane
- C) Methanoic acid
- D) Menthol

95) An allotrope of a non-metal is used in the tip of oil-drilling machines and for cutting glass. The structure of the allotrope is:

- A) Hexagonal
- B) Tetrahedral
- C) Rhombohedral
- D) Octahedral

96) What is the IUPAC name of the following structure?



- A) Pentane
- B) Butane
- C) Hexane
- D) Octane

97) Some substances called indicators are used to study different pH of solutions. Indicators are:

- A) Salts of organic acids
- B) Salts of inorganic acid
- C) Weak organic acids or base
- D) Weak inorganic acids or base

98) What is the commonality between an aqueous solution of inorganic acid and alkali?

- A) Both contain hydronium ions
- B) Both contain hydroxyl ions
- C) Both contain a mixture of cations and anions
- D) Both contain mixture of hydronium and hydroxyl ions

99) The hybridisation in ethane is:

- A) sp
- B) dsp²
- C) sp²
- D) sp³

100) Sulphur has been used in skin ointments since ancient times to treat skin ailments like acne, because:

- A) It has good anti-bacterial properties
- B) It ensures the fragrance helps in removing acne
- C) It detoxifies the blood and makes it pure and improves circulation
- D) It improves the complexion making it fairer, removing melatonin

101) Identify which among the following statements is FALSE regarding a chemical reaction:

- A) The total number of atoms of reactants and products are the same
- B) No new element is either created or destroyed
- C) The total mass of the reactants and products are the same
- D) The energy content of the reactants is equal to the energy content of the products

102) Which of the following is NOT a property of alloys?

- A) They enhance the hardness of a metal
- B) They reduce the tensile strength of a metal
- C) Alloys lower the melting point of a metal
- D) Alloys enhance corrosion resistance of a metal

103) Adding of water to concentrated acid is dangerous because:

- A) It forms an explosive mixture because of high amount of hydronium ion generation
- B) It forms an explosive mixture because of the generation of high heat of hydration
- C) It forms an explosive mixture because of very high ionisation of acid
- D) It forms an explosive mixture because concentrated acid has high dissociation constant

104) Normal lubricating oils cannot work when applied on moving parts of machines working at high temperature. But, the fine powder of a non-metal can be applied there as a lubricating agent because of its structure being:

- A) Rigid
- B) Amorphous
- C) Layered
- D) Multi-directional

105) Write a balanced chemical equation for the following reaction:

Calcium hydroxide + carbon dioxide → Calcium carbonate + water

- A) $\text{Ca(OH)}_3 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
- B) $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
- C) $\text{CaOH} + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
- D) $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{Ca(CO}_3)_2 + \text{H}_2\text{O}$

106) Zinc is widely used for making dry cells. The process by which its main ore is concentrated is:

- A) Gravity separation
- B) Froth floatation
- C) Electro refining
- D) Electromagnetic separation

107) A metal container is used for storing radio-isotopes. The main ore of this metal from among the given options is:

- A) Pyrites
- B) Galena
- C) Cassiterite
- D) Horn silver

108) Identify among the following the CORRECT ore from which a silvery white metal is extracted which is used for making cold drink cans.

- A) Fluorspar
- B) Cryolite
- C) Bauxite
- D) Galena

109) Two elements **A** and **B** occur in the same period. Both **A** and **B** combine to form a salt which when electrolysed, ions of **A** migrate towards anode and ions of **B** migrate towards cathode. **A** and **B** must be respectively:

- A) **A** ⇒ metal; **B** ⇒ non-metal
- B) **A** ⇒ non-metal; **B** ⇒ metal
- C) Both **A** and **B** non-metal
- D) Both **A** and **B** metal

110) There are four solutions **A**, **B**, **C** and **D** having **pH** **2.3**, **4.8**, **8.4**, **12.9** respectively. The one which has the **HIGHEST hydrogen ion** concentration will be:

- A) A
- B) B
- C) C
- D) D

Section 4 – Mathematics

111) The values of **x**, if $51+x+51-x=26$, are

- A) 1, 0
- B) 1, -1
- C) 1, 5
- D) 2, 3

112) By what number should 1679 be divided to get 27 as quotient and 32 as remainder?

- A) 61
- B) 32
- C) 63
- D) 37

113) The area of the quadrilateral whose vertices are (3, 0), (4, 5), (-1, 4) and (-2, -1) taken in order is

- A) 12 Sq. Units
- B) 16 Sq. Units
- C) 28 Sq. Units
- D) 24 Sq. Units

114) A cylindrical tub of radius 5 cm and length 9.8 cm is full of water. A solid in the form of a right circular cone mounted on a hemisphere is immersed into the tub. If the radius of hemisphere is 3.5 cm and height of the cone outside the hemisphere is 5 cm, then volume of water (take $\pi = 22/7$) in the tub is

- A) 154 cm³
- B) 616 cm³
- C) 338 cm³
- D) 465 cm³

115) If the given points (a, b+c), (b, x) and (c, a+b) are collinear, then the value x =

- A) a+b
- B) a+c
- C) a-c
- D) b-c

116) The age of father is 4 years more than 4 times the son's age. 4 years hence, the age of the father will be 10 years more than twice the age of the son. The present age of father is

- A) 24 years
- B) 33 years
- C) 40 years
- D) 54 years

117) The bisector of interior $\angle B$ of a triangle **ABC** meets **AC** in **D** and the bisector of exterior $\angle B$ meets AC produced in **E**. Then $\frac{AD}{AE} =$

- A) $\frac{CD}{CE}$
- B) $\frac{AC}{AE}$
- C) $\frac{BD}{BE}$
- D) $\frac{AB}{AC}$

118) Any point X inside the triangle $\triangle DEF$ is joined to its vertices. From a point P in DX, PQ is drawn parallel to DE meeting XE at Q and QR is drawn parallel to EF meeting XF at R. Then

- A) $PR \parallel DF$
- B) $PQ \parallel QR$
- C) $PR \parallel DE$
- D) $XQ \parallel XR$

119) If (1, y), (4, 3), (6, 6), (x, 5) are the vertices of a parallelogram taken in order, then the values of x and y are

- A) x=3, y=2
- B) x=4, y=3
- C) x=5, y=2
- D) x=1, y=2

120) If $(x \cos \theta + y \sin \theta) = a$, $(x \sin \theta - y \cos \theta) = b$, then $x^2 + y^2 =$

- A) 4ab
- B) a+b
- C) 1
- D) $a^2 + b^2$

121) The seventh term in the given sequence 1, 25, 49, 73 is

- A) 123
- B) 145
- C) 121
- D) 90

122) The value of $\frac{(1+\cot\theta+\tan\theta)(\sin\theta-\cos\theta)}{\sec 3\theta - \operatorname{cosec} 3\theta} =$

- A) $\sin\theta \cos\theta$
- B) $\sin 2\theta - \cos 2\theta$
- C) $\sin 2\theta \cos 2\theta$
- D) 1

123) The area of a rectangular plot is 528 sq.m. The length of the plot is one more than twice its breadth. The length of the plot is

- A) 16 m
- B) 12 m
- C) 20 m
- D) 33 m

124) From the top of a tower 50 m high the angle of depression of the top and bottom of a pole are observed to be 30° and 60° respectively, then the height of the pole, if the pole and tower stand on the same plane is

- A) 21.13 m
- B) $58\sqrt{3}$ m
- C) $57.7\sqrt{3}$ m
- D) 33.33 m

125) ABC is a right-angled triangle at A. A circle is inscribed in it. The length of the two sides containing the right angle are 3 cm and 4 cm. Then the radius of the incircle is

- A) 2.5 cm
- B) 2 cm
- C) 0.5 cm
- D) 1 cm

126) The quadratic polynomial whose zeros are $\frac{7}{\sqrt{3}}$, $\frac{2}{\sqrt{3}}$ is

- A) $x^2 - \sqrt{3}x - \frac{28}{3}$
- B) $x^2 - 3\sqrt{3}x + \frac{14}{3}$
- C) $x^2 - \sqrt{2}x + 1$
- D) $\sqrt{3}x^2 - 3x + 7$

127) The altitude of an equilateral triangle with side length of 4a cm is

- A) $2a\sqrt{3}$ cm
- B) $a\sqrt{3}$ cm
- C) 4a cm
- D) $a\sqrt{2}$ cm

128) If $0^\circ < A < 90^\circ$ and $\frac{\cos A}{1 - \sin A} + \frac{\cos A}{1 + \sin A} = 4$, then A =

- A) 30°
- B) 60°
- C) 45°
- D) 15°

129) ABC and DEF are two similar triangles such that BC = 6 cm, the corresponding side EF = 8 cm and the area of triangle ABC is 81 sq.cm. Then the area of the triangle DEF is

- A) 108 cm²
- B) 144 cm²
- C) 112 cm²
- D) 150 cm²

130) The ratio of the area of the triangle ABC to the area of the triangle formed by joining the midpoints of the sides of this triangle, where vertices are A (-5, -1), B (3, -5) and C (5, 2), is

- A) 2 : 1
- B) 4 : 1
- C) 1 : 4
- D) 1 : 8

131) If $\tan A + \sin A = m$, $\tan A - \sin A = n$, then $4\sqrt{mn} =$

- A) $m^2 - n^2$
- B) $m^2 + n^2$
- C) $m + n$
- D) $2mn$

132) If α, β are the zeros of the polynomial $f(x) = 2x^2 + 5x + k$ satisfying the relation $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then the value of k is

- A) 7
- B) 4
- C) 2
- D) 1

133) The value of 'y' if

$$\frac{1}{3x+y} + \frac{1}{3x-y} = \frac{3}{4}, \quad \frac{1}{2(3x+y)} - \frac{1}{2(3x-y)} = \frac{-1}{8}$$

- A) 2
- B) -3
- C) 1
- D) -1

134) The H.C.F of 274170 and 17017 is

- A) 13
- B) 19
- C) 17
- D) 15

135) A passenger train takes 4 hours less for a journey of 400 km, if its speed is increased by 5 km/hr from its usual speed. Its usual speed is

- A) 20km/hr
- B) 25km/hr
- C) 16km/hr
- D) 9km/hr

136) The value of

$$3(\sin x - \cos x) + 6(\sin x + \cos x) + 2 + 4\sin 4x + \cos 6x =$$

- A) 1
- B) 0
- C) 13
- D) 15

137) If there are three points A = (3, -5), B = (5, 7) and C = (2, -3), then the equation of a straight line passing through B and perpendicular to the line AC is

- A) $x + 6y - 6 = 0$
- B) $9x + y + 3 = 0$
- C) $x - 2y + 9 = 0$
- D) $2x - y - 9 = 0$

138) The value of $\frac{\sin 20^\circ + \sin 70^\circ}{\cos 259^\circ + \cos 231^\circ} + \sin 35^\circ \sec 55^\circ =$

- A) 1
- B) 2
- C) 0
- D) 1/2

139) If $x = a \cos \theta, y = b \cot \theta$, then $\frac{a^2}{x^2} - \frac{b^2}{y^2} =$

- A) 1
- B) $\tan \theta$
- C) 0
- D) $\sin \theta$

140) In a triangle ABC, DE is parallel to the base BC with D on AB and E on AC. If $\frac{AD}{DB} = \frac{5}{3}$, then $\frac{BC}{DE} =$

- A) 5/2
- B) 8/5
- C) 2/3
- D) 4/5

141) The coordinates of the point of trisection of a segment joining A (-2, 5) and B (3, 2) is

- A) (5, 4)
- B) (8/3, 3)
- C) (4/3, 3)
- D) (6, 7)

142) The value of $\sqrt{\frac{\sec \theta - 1}{\sec \theta + 1}} + \sqrt{\frac{\sec \theta + 1}{\sec \theta - 1}} =$

- A) $\operatorname{cosec} \theta + \cot \theta$
- B) $2 \operatorname{cosec} \theta$
- C) $\frac{1 - \sin \theta}{1 + \cos \theta}$
- D) $\frac{\sin \theta}{1 + \cos \theta}$

143) From a window (h meters high above the ground) of a house in a street, the angle of elevation and depression of the top and foot of another house on the opposite side of the street are α and β respectively. The height of the opposite house is

- A) $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$
 B) $h(\tan \alpha + \cot \beta)$
 C) $\frac{2h \sec \alpha}{\tan \beta - \tan \alpha}$
 D) $h(1 + \tan \alpha \cot \beta)$

144) On dividing the polynomial $f(x) = x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient is $q(x)$ and remainder is $r(x)$ where $q(x) = x - 2$ and $r(x) = -2x + 4$ respectively. The polynomial $g(x) =$

- A) $x^2 - x + 1$
 B) $8x^2 + 8x + 4$
 C) $6x^2 - 3$
 D) $4x^2 + 4x + 20$

145) The value of 'x',

if $\frac{xy}{x+y} = \frac{-6xy}{y-x}$, $x \neq 0, y \neq 0$

- A) $x = 3$
 B) $x = -3$
 C) $x = 2$
 D) $x = 1$

146) A box contains 20 balls bearing numbers 1, 2, 3, 4, ..., 20. A ball is drawn at random from the box. Then the probability that the number on the ball is a composite number is

- A) $4/5$
 B) $11/20$
 C) $13/20$
 D) $1/2$

147) If $\cos \theta = 3/5$, then the value of $\cot \theta - \operatorname{cosec} \theta =$

- A) $1/2$
 B) 2
 C) -1
 D) $-1/2$

148) Two dice are thrown once. The probability of obtaining a total more than 7 is

- A) $1/6$
 B) $1/12$
 C) $5/36$
 D) $5/12$

149) A bag contains 6 black, 5 red and 3 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is red or white is

- A) $4/7$
 B) $7/15$
 C) $3/14$
 D) $2/7$

150) A man bought a certain number of toys for Rs.160. He kept one for his own use and sold the rest for one rupee each more than he gave for them. Besides getting his own toy for nothing he made a profit of Rs.11. Then the number of toys are

- A) 10
 B) 30
 C) 20
 D) 15

151) A fraction becomes $9/11$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and denominator it becomes $5/6$, then the fraction is

- A) $4/9$
 B) $4/7$
 C) $7/9$
 D) $5/9$

152) ABC is an isosceles triangle with $AB=AC=15$ cm. The length of altitude from A on BC is 9 cm. Then BC =

- A) 20 cm
- B) 18 cm
- C) 12 cm
- D) 24 cm

153) The values of x and y, if the system of equations is given by $ax+by = a-b$, $bx-ay = a+b$, are

- A) -1, 1
- B) -1, -1
- C) 1, 2
- D) 1, -1

154) The roots of the quadratic equation $2y^2 + 2\sqrt{2}y + 1 = 0$ are

- A) $\frac{1}{2}, \frac{1}{2}$
- B) 1, 4
- C) $-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$
- D) $\frac{1}{\sqrt{2}}, \frac{1}{2}$

155) The horizontal distance between two towers is 150 m. The angle of depression of the top of the first tower when seen from the top of the second tower is 45° . If the height of the first tower is 50 m, then the height of the second tower is

- A) 200 m
- B) 140.83 m
- C) $119\sqrt{3}$ m
- D) $150\sqrt{3}$ m

156) The value of x, if $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, is

- A) -b, a
- B) -a, -b
- C) 0, a
- D) a, b

157) If the equation $kx(x-2)+6 = 0$ has two real equal roots, then the value of 'k' is

- A) $\pm 2\sqrt{6}$
- B) 10
- C) $\frac{1}{2}$
- D) 6

158) A spiral wire is made up by joining successive semicircles of wires of radius 1 cm, 1.5 cm, 2.0 cm, 2.5 cm and so on. What is the total length (taking $\pi = \frac{22}{7}$) of the spiral made up from 14 consecutive semicircles?

- A) 187 cm
- B) 143 cm
- C) 168 cm
- D) 209 cm

159) The value of
$$\frac{\tan 60^\circ + 4\cos 45^\circ + 3\operatorname{cosec} 260^\circ + 2\cos 90^\circ}{4\operatorname{cosec} 30^\circ + 3\sec 60^\circ - \cot 30^\circ} =$$

- A) $\frac{5}{3}$
- B) $2\sqrt{3}$
- C) 9
- D) $\frac{9}{5}$

160) The equation of the line that cuts off intercepts 'a' and 'b' on the X-axis and Y-axis respectively, such that $a+b = 4$ and $ab = 3$, is

- A) $3x+y=3$ or $x+3y=3$
- B) $2x+y=2$ or $x+2y=2$
- C) $x-3y=3$ or $3x-y+3=0$
- D) $2x+3y=1$ or $9x-10y=74$

161) A piggy bank contains hundred 50 p coins, fifty Re. 1 coins, thirty Rs. 2 coins and five Rs. 5 coins. If it is equally likely that one of the coin will fall out when the bank is turned upside down. The probability that the coin will NOT be a Rs. 5 coin is

- A) $\frac{17}{18}$
- B) $\frac{36}{37}$
- C) $\frac{16}{25}$
- D) $\frac{5}{9}$

162) A wooden article was made by scooping out a hemisphere from each end of a cylinder. If the height of the cylinder is 8 cm and its base diameter is 7 cm, then the total surface area of the article when it is ready is

- A) 374 cm²
- B) 770 cm²
- C) 330 cm²
- D) 253 cm²

163) If $(2.6)^x = (0.26)^y = 1000$, then the value of $\frac{1}{x} - \frac{1}{y} =$

- A) 3
- B) $\frac{1}{2}$
- C) 1
- D) $\frac{1}{3}$

164) A solid sphere of radius 6 cm is melted into a hollow cylinder of uniform thickness. If the external radius of the base of the cylinder is 4 cm and its height is 24 cm. Then the uniform thickness of the cylinder is

- A) 5 cm
- B) 3 cm
- C) 4 cm
- D) 2 cm

165) The total surface area of a hemisphere of radius 4.2 cm (take $\pi = \frac{22}{7}$) is

- A) 160.32 sq cm
- B) 115.5 sq cm
- C) 167.25 sq cm
- D) 166.32 sq cm

166) A right circular cone is 8 cm high and the radius of its base is 2 cm. The cone is melted and recast into a sphere, then the diameter of the sphere is

- A) 2 cm
- B) 6 cm
- C) 8 cm
- D) 4 cm

167) The difference of two numbers is 4 and the difference of their reciprocal is $\frac{1}{8}$. Then the numbers are

- A) 8, 12
- B) 4, 8
- C) 5, 9
- D) 11, 15

168) A rectangular park is to be designed whose breadth is 4 m less than its length. Its area is to be 10 sq.m more than the area of the park that has already been made in the shape of isosceles triangle, with its base as the breadth of the rectangular park and the altitude 14 m. Then the length of the rectangular park is

- A) 4 m
- B) 5 m
- C) 7 m
- D) 9 m

169) A metallic right circular cone with 20 cm height and whose vertical angle is 60° is cut into two parts at the middle point of its height by a plane parallel to the base. If the frustum so obtained be drawn into a wire of diameter $\frac{1}{16}$ cm, then the length of wire is

- A) 30400 m
- B) 7964.44 m
- C) 1068.57 m
- D) 3460.65 m

170) If the bisector of an angle of a triangle bisects the opposite side, then the triangle cannot be

- A) an equilateral triangle
- B) a scalene triangle
- C) a right-angled triangle
- D) an isosceles triangle

171) A conical vessel of radius 5 cm and height 12 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed, the fraction of water overflows is

- A) $\frac{3}{8}$
- B) $\frac{40}{81}$
- C) $\frac{53}{81}$
- D) $\frac{63}{8}$

172) In the triangle $\triangle ABC$, $DE \parallel BC$ and $5AD = DB$. If $AC = 4.8$ cm, then $AE =$

- A) 2.1 cm
- B) 3.5 cm
- C) 0.8 cm
- D) 1.2 cm

173) If the radii of the circular ends of a conical bucket which is 48 cm high are 21 cm and 7 cm, then the capacity of the bucket (take $\pi = \frac{22}{7}$) is

- A) 48510 cm³
- B) 10459 cm³
- C) 25667 cm³
- D) 32032 cm³

174) A tent of height 3.3 m is in the form of a right circular cylinder of diameter 12 m and height 2.2 m, surmounted by a right circular cone of the same diameter, then the cost of the canvas of the tent at the rate of Rs. 600 per m² is

- A) Rs. 1,18,000
- B) Rs. 1,18,800
- C) Rs. 8,31,600
- D) Rs. 2,30,000

175) The radius of a conical tent is 3 m and its height is 4 m. Then the length of canvas used in making the tent if width of canvas is 4 m ($\pi = \frac{22}{7}$) is

- A) 134.2 m
- B) 11.78 m
- C) 22.72 m
- D) 150.40 m

176) Radha whose height is 150 cm is going away from a lamp post at a speed of 1.5 m/sec. If the lamp post is 3.5 m on the ground, then the length of her shadow after 4 seconds is

- A) 3.5 m
- B) 2 m
- C) 4.5 m
- D) 1.9 m

177) In equilateral triangle ABC, the side BC is trisected at D, such that $BC = 3BD$, then $7AB^2 =$

- A) $9AD^2$
- B) $5BC^2$
- C) $4DE^2$
- D) $3AD^2$

178) ABC is a right-angled triangle, right angled at C. If x is the length of the perpendicular from C to AB and $AB = c$, $BC = a$ and $CA = b$, then $\frac{1}{x^2} =$

- A) $\frac{1}{ab}$
- B) $\frac{1}{a^2} + \frac{1}{b^2}$
- C) $a^2 + b^2$
- D) $a^2 - b^2$

179) If α and β are the zeroes of the polynomial $x^2 + 4x + 3$, the polynomial whose zeroes are $(1 + \beta/\alpha)$ and $(1 + \alpha/\beta)$ is

- A) $x^2 - 11x + 30$
- B) $4x^2 - 4x - 3$
- C) $3x^2 - 16x + 16$
- D) $7x^2 - 22x + 7$

180) The sum of two natural numbers is 6. If the sum of their reciprocals is $\frac{6}{5}$, the numbers are

- A) 4 and 2
- B) 5 and 1
- C) 3 each
- D) NOT possible to determine.